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# **Suisun Marsh Monitoring Program Channel Water Salinity Report**

Reporting Period: December 2003

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## 1. SUISUN MARSH MONITORING STATIONS AND REPORTING REQUIREMENT

As per SWRCB Water Rights Decision 1641, dated December 29, 1999, and previous SWRCB decisions, the California Department of Water Resources (DWR) is required to provide monthly channel water salinity compliance reports for the Suisun Marsh to the SWRCB. Conditions of channel water salinity in the Suisun Marsh are determined by specific electrical conductivity. Specific electrical conductivity is referred to in the reports as "specific conductance". The locations of all listed stations are shown in Figure 5.

The monthly reports are submitted for October through May of the following calendar year in accordance with SWRCB requirements. This report is required to include salinity data from the stations listed below:

Station Identification	Station Name	General Location	Classification
C-2*	Collinsville	Western Delta	Compliance Station
S-64	National Steel	Eastern Suisun Marsh	Compliance Station
S-49	Beldon's Landing	North-Central Suisun Marsh	Compliance Station
S-42	Volanti	North-Western Suisun Marsh	Compliance Station
S-21	Sunrise	North-Western Suisun Marsh	Compliance Station

In addition, data from the stations listed below are included in the monthly reports to provide information on salinity conditions in the western Suisun Marsh.

Station Identification	Station Name	General Location	Classification
S-97	Ibis	Western Suisun Marsh	Monitoring Station
S-35	Morrow Island	South-Western Suisun Marsh	Monitoring Station

Information on Delta outflow, area rainfall, and operation of the Suisun Marsh Salinity Control Gates are also included in the monthly reports to provide information on conditions that may affect channel water salinity in the Marsh.

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\* Throughout the report, the representative data from nearby USBR station is used in lieu of data from station C-2.

## 2. Monitoring Results

### 2.1 Channel Water Salinity Compliance

During the month of December, 2003, salinity conditions at all five compliance stations are in compliance with channel water salinity standards of SWRCB (Table 1). Compliance with standards for the month of December was determined for each compliance station by comparing the progressive daily mean of high-tide specific conductance (SC) with respective standards. The standard for the eastern and western compliance stations was 15.5 mS/cm during December 2003. Table 1 lists monthly mean high-tide SC at these compliance stations. The progressive daily mean (PDM) is the monthly average of both daily high-tide SC values. The mathematical equation is shown below.

$$\text{PDM} = \frac{\sum \text{daily average of high tide SC}}{\text{\# days of the month}}$$

### 2.2 Delta Outflow

High outflow in the second half of December was a result of significant precipitation resulting in high runoff from the major rivers. The December Delta outflow varied from 5,000 cfs to 46,000 cfs as shown in Figure 3. December outflow started off low, around 5,000 cfs, but increased thereafter. From December 4 and beyond, Delta outflow remained above 10,000 cfs. It increased to about 25,000 cfs on December 11, and fluctuated between 18,000 cfs and 25,000 cfs until December 25, where it remarkably increased for the rest of December. The peak outflow occurred on December 30, 2003, with an outflow of about 46,000 cfs. The monthly Delta outflow is represented by the mean Net Delta Outflow Index (NDOI). The NDOI is the estimated daily average of Delta outflow. Mean NDOI for December is listed below:

Month	Mean NDOI (cubic feet per second)
December	22,106

## 2.3 Rainfall

Total monthly rainfall at the Waterman Gauging Station in Fairfield during December 2003 is listed below:

Month	Total Rainfall (inches)
December	6.49

## 2.4 Suisun Marsh Salinity Control Gate (SMSCG) Operations

Operations and flashboard/boat lock installations at the SMSCG during December 2003 is summarized below.

Date	Gate status	Flashboards status	Boat Lock status
December 1 - 14	3 gates operating	Installed	Closed
December 15 - 31	3 gates open	Installed	Closed

The salinity control gates were operated during the first half of December to control salinity. However, with significant precipitation during the second half of December resulting in high outflows and favorable water quality levels throughout the marsh, gate operations were suspended on December 15, 2003. The gates remain open for the remainder of December, and will continue to do so until water quality warrant re-operation of the gates.

## 3. Discussion

### 3.1 Factors Affecting Channel Water Salinity in the Suisun Marsh

Factors that affect channel water salinity levels in the Suisun Marsh include:

- delta outflow;
- tidal exchange;
- rainfall and local creek inflow;
- managed wetland operations; and,
- operation of the SMSCG and flashboard configurations.

## **3.2 Observations and Trends**

### **3.2.1 Conditions during the Reporting Period**

During December 2003, salinity concern did not arise due to favorable water quality conditions. Salinity levels at all compliance stations varied between 4.0 mS/cm and 12.0 mS/cm as shown in Figure 1. At the two monitoring stations (S-97 and S-35) salinity levels ranged from 11.0 mS/cm and 15.0 mS/cm as shown in Figure 2. Salinity levels at Volanti (S-42) and Sunrise (S-21) started off below 12.0 mS/cm, whereas the three eastern stations started off below 9.0 mS/cm. The first outflow peak of about 25,000 cfs occurred on December 12, 2003. This first peak resulted salinity levels in the marsh to decline as shown in Figure 1. The slope of the salinity decline at Sunrise (S-21), Ibis (S-97), and Morrow Club (S-35) are about 3:1 compared to other compliance stations due to the proximity of these stations being in the northwest end of the marsh and further away from gate and outflow effects. The second outflow peak of about 27,000 cfs occurred on December 18, 2003, and resulted in further salinity level reduction at all compliance and monitoring stations in the marsh. Due to satisfactory water quality, gate operations were ceased on December 15, 2003. Overall, salinity levels were below the standard of 15.5 at both eastern and western stations.

Channel water salinity conditions in the marsh appeared to be influenced by both gate operations and high outflows in December 2003.

### **3.2.2 Comparison of Reporting Period Conditions with Previous Years**

Monthly mean high-tide SC at the compliance and monitoring stations for December 2003 were compared with means for those months during the previous nine years (Figure 4).

Means salinity pattern of all compliance and monitoring stations were similar to that of December 1999, but with lower magnitude, except for S-97. Comparing to the previous nine years, the following observations are made for each of the stations salinity levels:

- C-2 salinity level for December 2003 was the fifth highest
- S64 salinity level for December 2003 was the sixth highest
- S49 was the sixth highest
- S42 was at the same level as that of 1997, and was fifth highest
- S21 was the third highest
- S97 was at the same level as 1994, and was third highest
- S35 was the fourth highest

Overall, December 2003 salinity levels were ranked fifth in high Specific Conductance.

**Table 1****Monthly Mean High Tide Specific Conductance at Suisun Marsh  
Water Quality Compliance Stations****December 2003**

Station	Specific Conductance (mS/cm)*	Standard	Standard meet?
C-2**	3.8	15.5	Yes
S-64	4.2	15.5	Yes
S-49	7.0	15.5	Yes
S-42	8.4***	15.5	Yes
S-21	8.5	15.5	Yes

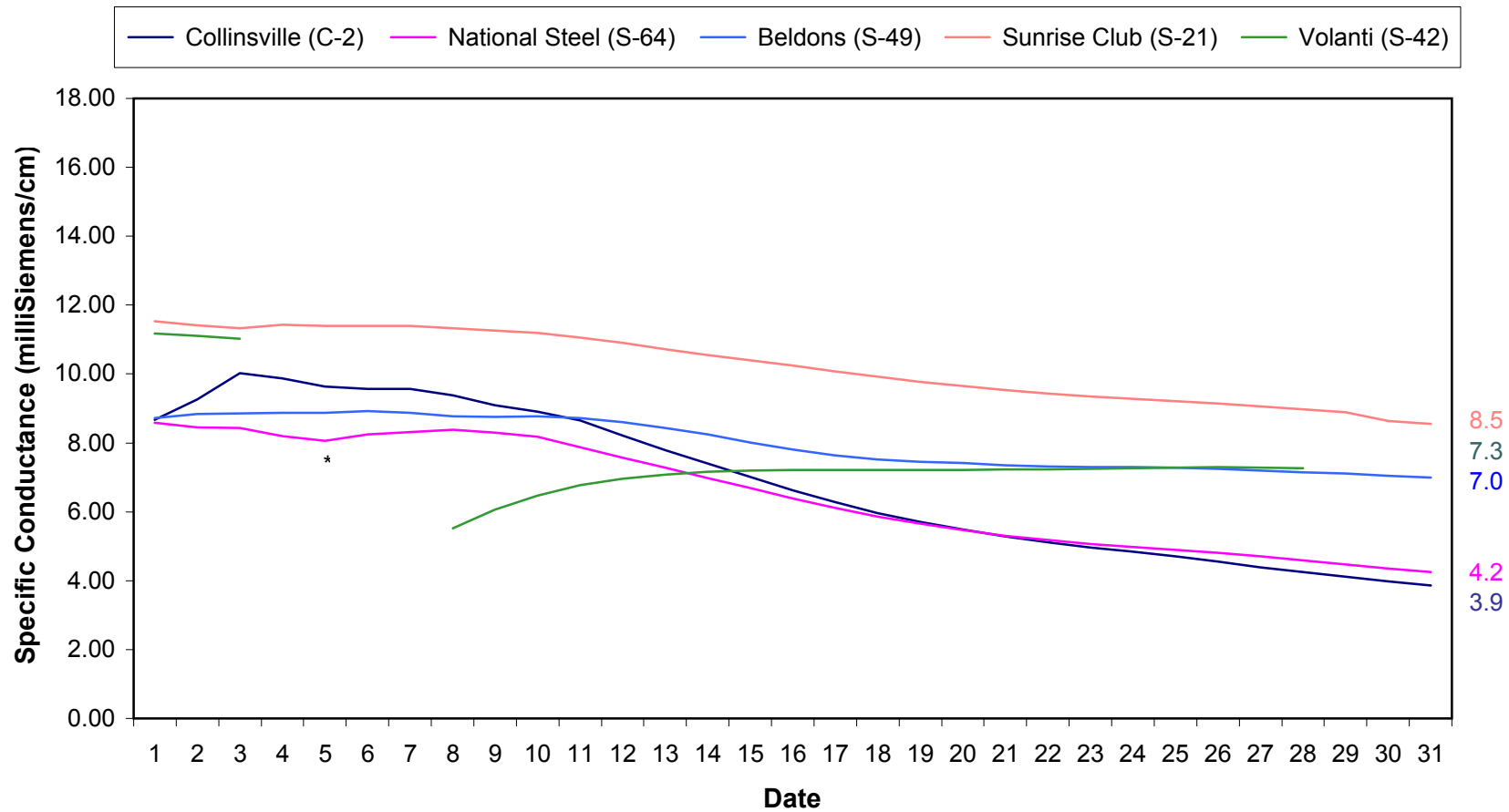
\*milliSiemens per centimeter

\*\*The representative data from nearby USBR station is used in lieu of data from station C-2.

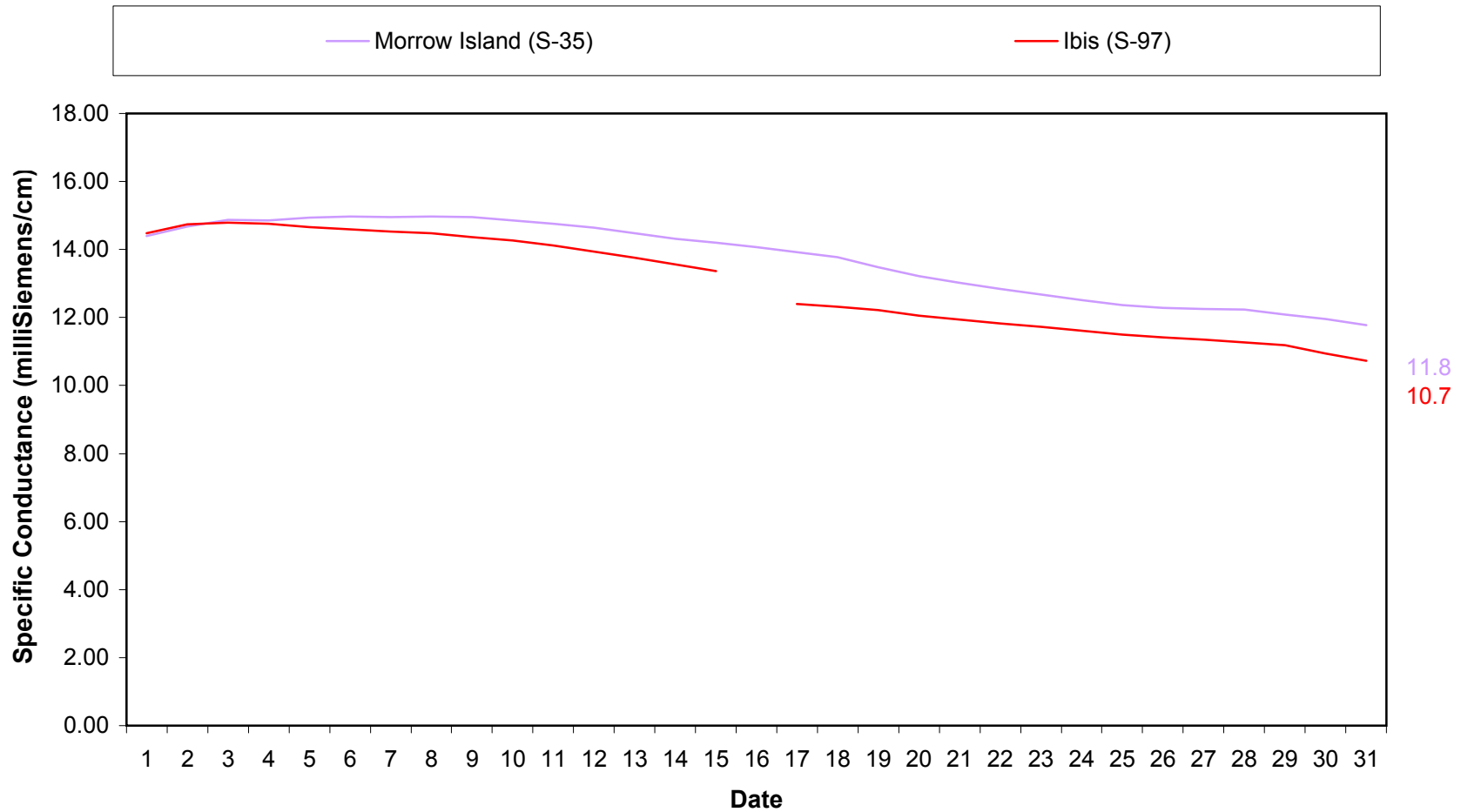
\*\*\*Value does not reflect actual end of month PDM due to equipment problems. However, the number of missing data during the month was low enough that it did not alter the end of month result.

**Figure 1. Suisun Marsh Progressive Mean High Tide Specific Conductance  
December 2003**

Standard = 15.5 mS/cm

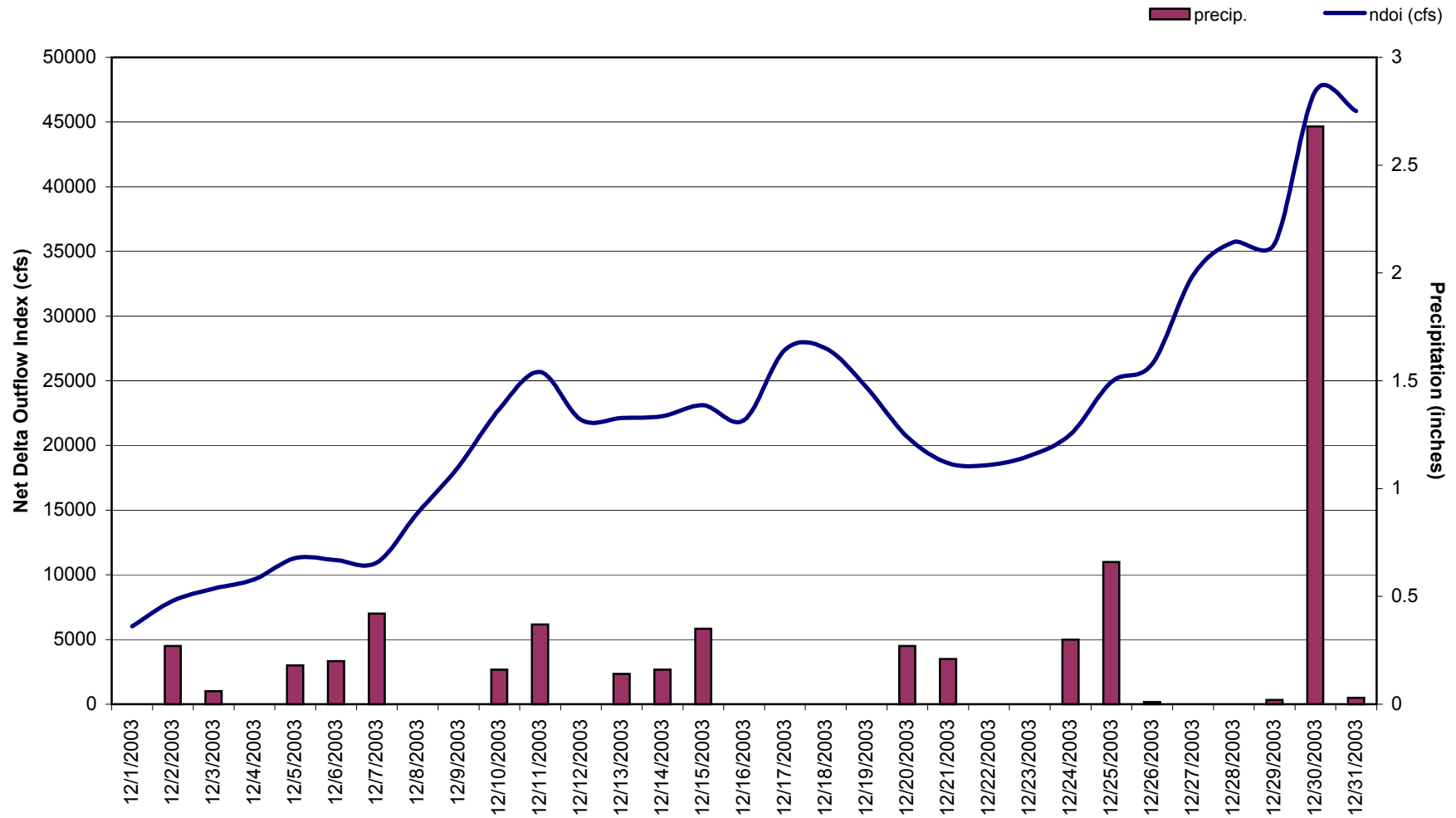


**Figure 2. Suisun Marsh Progressive Mean High Tide Specific Conductance  
December 2003**



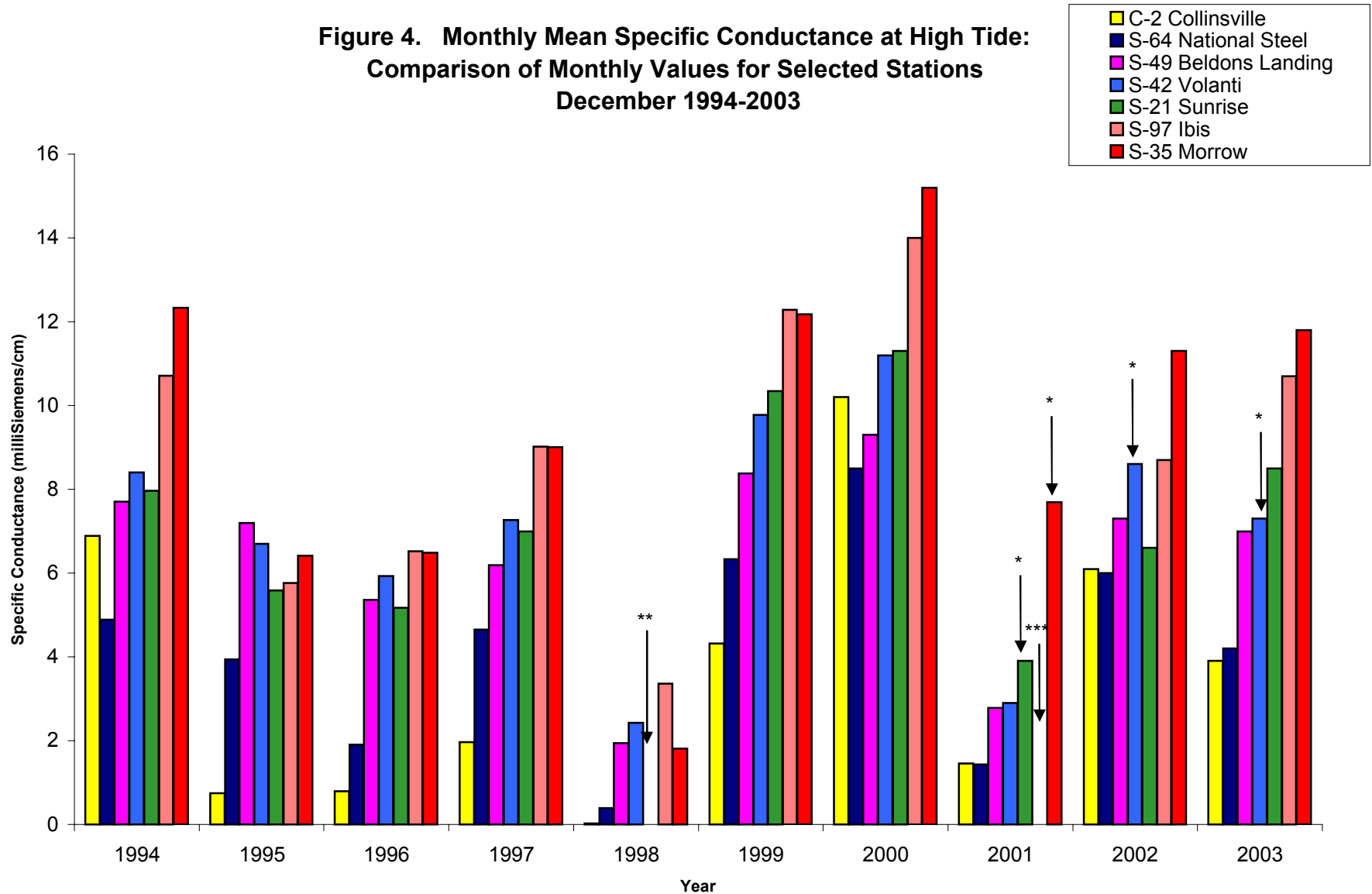
Note: S-97 data missing due to equipment problem.

**Figure 3. Daily Net Delta Outflow Index and Precipitation\*  
December 2003**



\*Preliminary DWR, O&M Delta Outflow data and precipitation from Fairfield Water Treatment Plant.

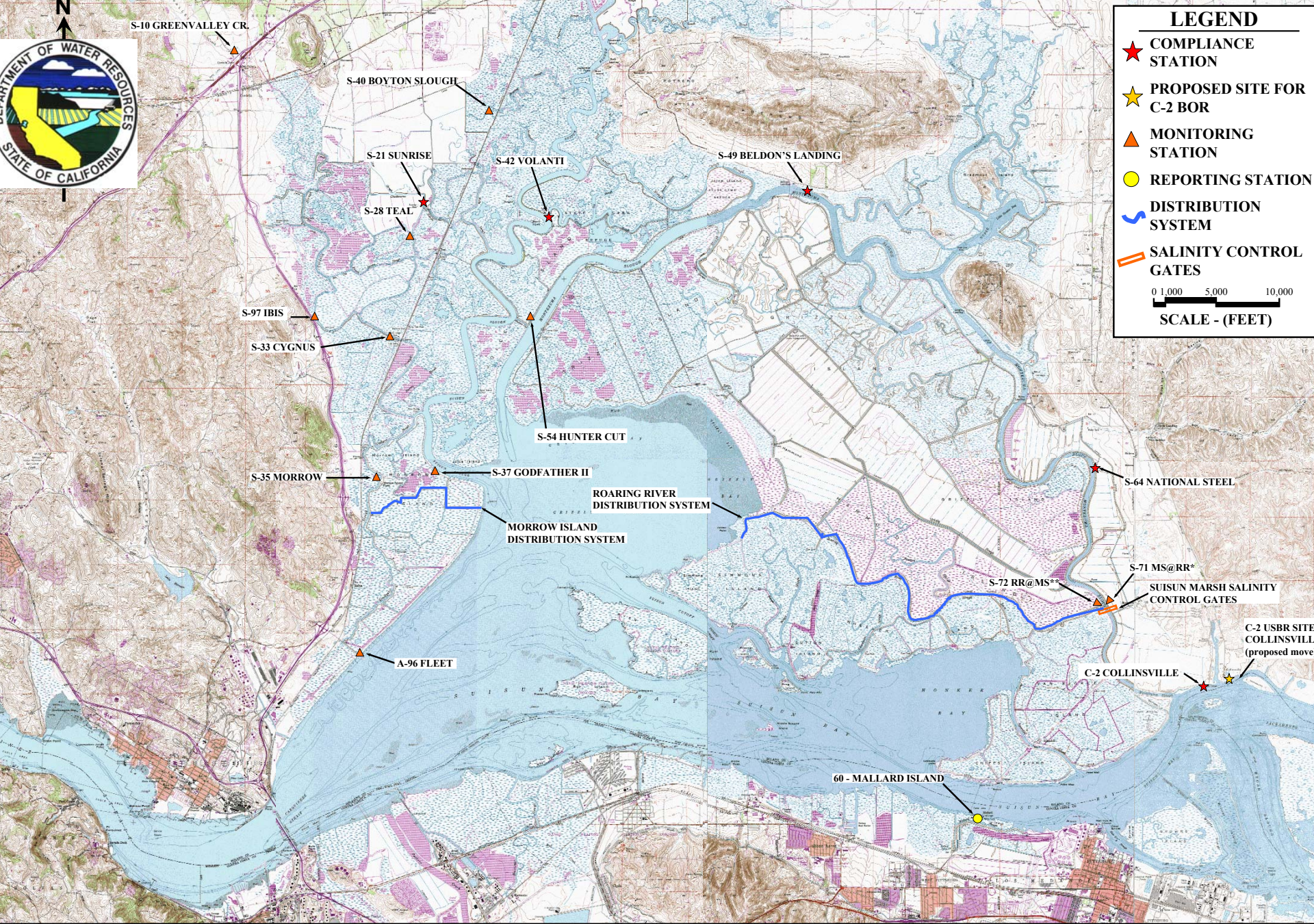
**Figure 4. Monthly Mean Specific Conductance at High Tide:  
Comparison of Monthly Values for Selected Stations  
December 1994-2003**



\* Data does not reflect partial month. Data collection was interrupted before the end of the month due to equipment failure.

\*\* Data was not obtained due to power problems at the station.

\*\*\* Data was not obtained due to equipment failure.



## SUISUN MARSH PROGRAM WATER QUALITY MONITORING AND CONTROL FACILITIES